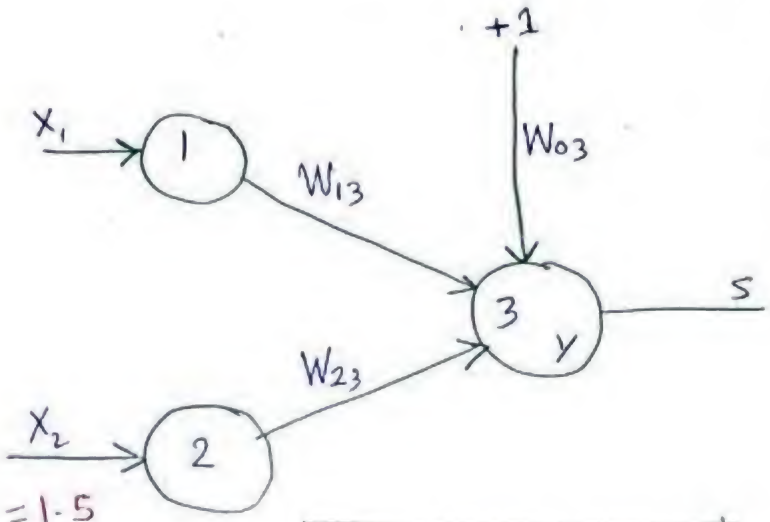
[8]

Activation function or threeshold function

$$s = \begin{cases} 1 & y \geq 0 \\ 0 & y < 0 \end{cases}$$



if $W_{13} = 2, W_{23} = 2, W_{03} = 1.5$

Prove that this is OR

$$y = X_1 W_{13} + X_2 W_{23} + W_{03}$$
$$= 2X_1 + 2X_2 - 1.5$$

X_1	X_2	s
0	0	0
0	1	1
1	0	1
1	1	1

a) $X_1 = X_2 = 0$

$y = -1.5 < 0 \Rightarrow s = 0$

b) $X_1 = 0, X_2 = 1$

$y = 0.5 > 0 \Rightarrow s = 1$

c) $X_1 = 1, X_2 = 0$

$y = 0.5 > 0 \Rightarrow s = 1$

d) $X_1 = 1, X_2 = 1$

$y = 2.5 > 0 \Rightarrow s = 1$

∴ This network is OR

as

$(W_{13} \& W_{23}) > W_{03}$

system is representing OR circuit.

Design

"Things we have to Know before design"

1) no. of i/p and o/p.

2) hidden layer (linear or non linear)

3) no. of neuron/layer.

4) Activation function / neuron.

5) weights ⟶ (learning Algorithm)

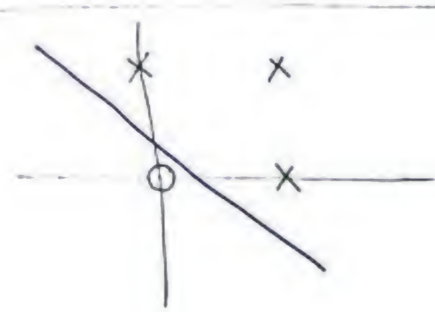
Design OR 2-input

X_1	X_2	S	
0	0	0	o
0	1	1	x
1	0	1	x
1	1	1	x

① i/p = 2 , o/p = 1

② لو نرى الرسم عندي خط وحيد يقدر
يعمل فصل للحالة فتكون (linear)

∴ no hidden layer.

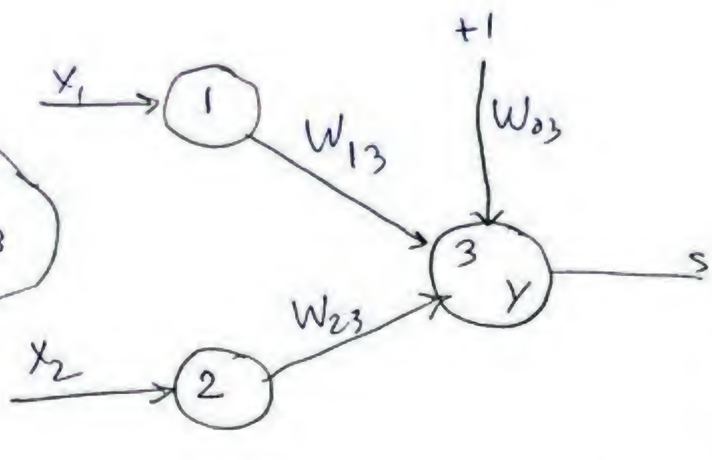


3) one neuron.

4) threshold function.

5) weights

$$Y = X_1 W_{13} + X_2 W_{23} + W_{03}$$



a) $X_1 = 0$, $X_2 = 0 \longleftrightarrow S$ required to be 0

$Y = W_{03} < 0$

لازم Y تكون أقل من الصفر
عشان توصلنا لـ $(S = 0)$
$\therefore W_{03} < 0$

if A → +ve value

$$\boxed{W_{03} = -A}$$

b) $X_1 = 0$, $X_2 = 1 \longrightarrow S = 1$

$$Y = W_{23} + W_{03} > 0 \Rightarrow \boxed{W_{23} > A}$$

c) $X_1 = 1$, $X_2 = 0 \longrightarrow S = 1$

$$Y = W_{13} + W_{03} > 0 \Rightarrow \boxed{W_{13} > A}$$

d) $X_1 = 1$, $X_2 = 1 \longrightarrow S = 1$

$$X = W_{13} + W_{23} + W_{03} > 0 \Rightarrow \boxed{W_{13} + W_{23} > A}$$

(And)

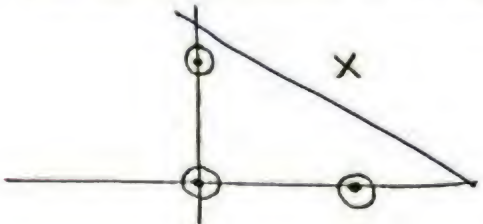
X_1	X_2	S
0	0	0
0	1	0
1	0	0
1	1	1

1) i/p = 2 , o/p = 1

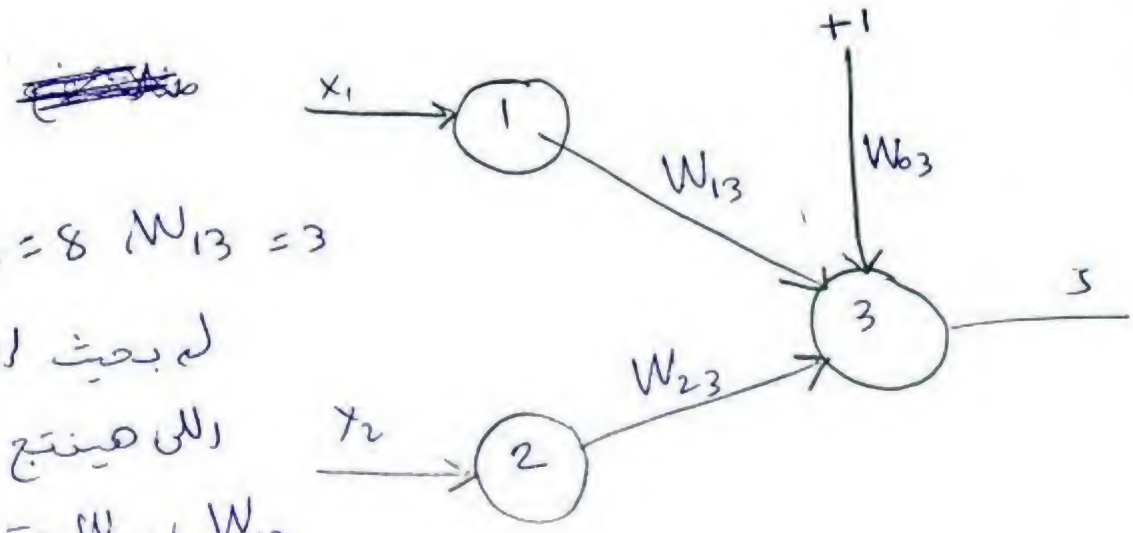
2) no hidden layer

3) one neuron

4) threshold function



Let:



$W_{03} = -10$ ، $W_{23} = 8$ ، $W_{13} = 3$

لم بحيث ان العدد الوحيد
والذي سينتج خرج صفر ان
W_{13} ، W_{23} متحيزين يكونوا
أكبر من W_{03}.

$$Y = W_{13} X_1 + W_{23} X_2 + W_{03}$$

a) $X_1 = 0$ ، $X_2 = 0$ $\longleftrightarrow$ $S = 0$

$Y = W_{03} < 0$ $\Rightarrow$ $W_{03} = -A$

b) $X_1 = 0$ ، $X_2 = 1$ $\longrightarrow$ $S = 0$

$Y = W_{23} + W_{03} < 0$ $\Rightarrow$ $\boxed{W_{23} < A}$

c) $X_1 = 1$ ، $X_2 = 0$ $\longrightarrow$ $S = 0$

$Y = W_{13} + W_{03} > 0$ $\Rightarrow$ $\boxed{W_{13} < A}$

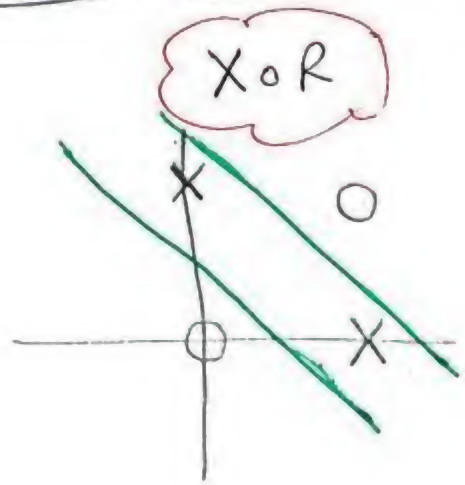
d) $X_1 = 1$ ، $X_2 = 1$ $\longrightarrow$ $S = 0$

$Y = W_{13} + W_{23} + W_{03} > 0$

$\boxed{W_{13} + W_{23} > A}$

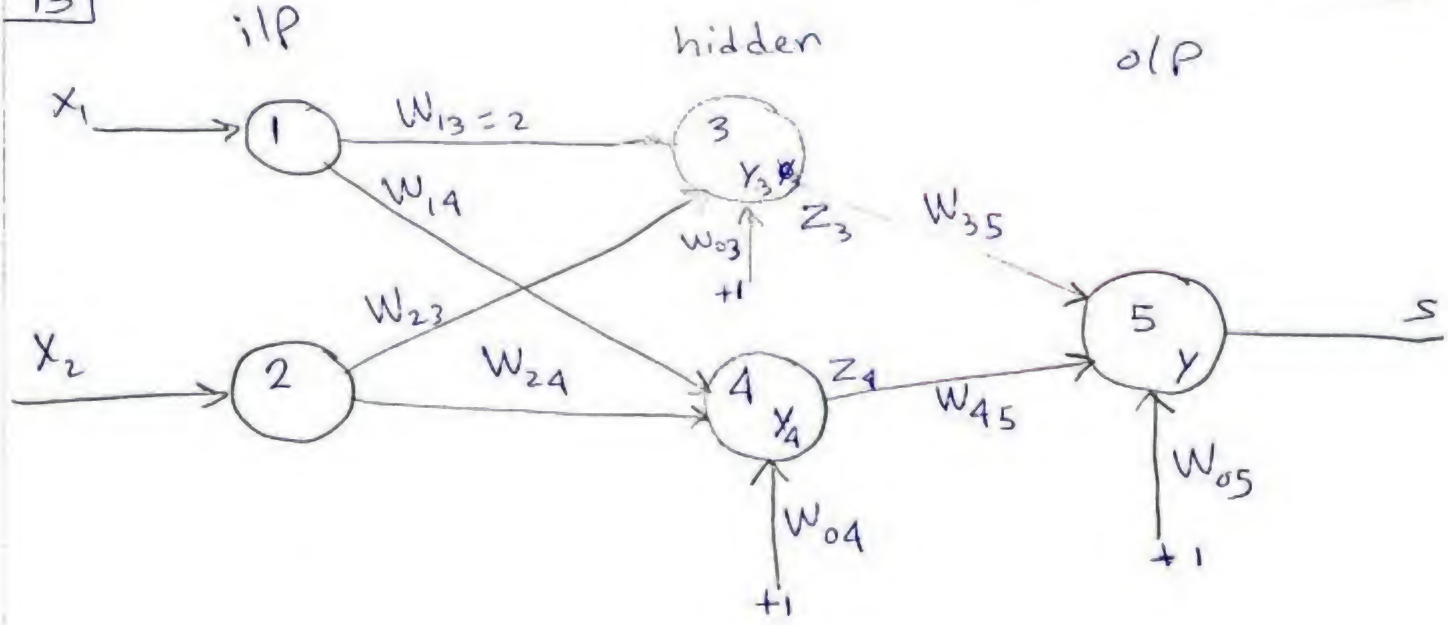
لو عايز أجيب (NAnd) هجيب مسألة الـ (AND) وأغير لشارات الـ W_{13} ، W_{23} ، W_{03} وهكذا مع (NoR).

(non linear)



X_1	X_2	S
0	0	0
0	1	1
1	0	1
1	1	0

13



$W_{13}=2$ ، $W_{24}=2$ ، $W_{14}=-1$ ، $W_{35}=2$ ، $W_{04}=-1.5$

$W_{23}=-1$ ، $W_{45}=2$ ، $W_{05}=-1.5$ ، $W_{03}=-1.5$

* Prove that this is XoR gate

$Y_3 = 2X_1 - X_2 - 1.5$ & $Y_4 = -X_1 + 2X_2 - 1.5$

$Z_3 = f(y_3)$ & $Z_4 = f(y_4)$

$y = 2Z_3 + 2Z_4 - 1.5$ & $S = f(y)$

a) $X_1 = 0$ ، $X_2 = 0$

$y_3 = -1.5 \Rightarrow Z_3 = 0$

$y_4 = -1.5 \Rightarrow Z_4 = 0$ Cause $y_4 < 0$

$y = -1.5 \Rightarrow S = 0$

b) $X_1 = 0$ ، $X_2 = 1$

$y_3 = -2.5 \Rightarrow Z_3 = 0$

$y_4 = 0.5 \Rightarrow Z_4 = 1$

$y = 0.5 \Rightarrow S = 1$

لـ باقي التعويضات كما هي وصلنا لإن الدائرة تعتبر (XOR).